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(54) Title: FERTILISER

(57) Abstract

The present invention provides a liquid fertiliser comprising a mixture of a salt of phosphorous acid together with either a thiosulphate such as ammonium or potassium thiosulphate and/or a salt of salicylic acid or salicyle amide. The use of this combination as a foliar spray, soil drench or irrigation component produces a greater fertiliser effect (on plant vigour and growth) and greater resistance to or control of parasitic fungal diseases, than each of the components applied individually or any combination of just two components.

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1  
Fertiliser

The present invention relates to novel compositions having fertilising and anti-fungal effects, to processes for their preparation, and to methods of fertilising plants and controlling fungi using them.

5 Phosphorus is one of the essential major elements required by plants and it is usually supplied to plants in the form of phosphate and/or polyphosphate. Phosphates are the salts of phosphoric acid (having the formula H<sub>3</sub>PO<sub>4</sub> and molecular weight of 98). In recent years, it has been shown that plants can obtain phosphorus from phosphonates (sometimes also referred to as phosphites) which 10 are the salts (organic or inorganic) of phosphonic acid (also referred to as phosphorous acid) (having the formula H<sub>3</sub>PO<sub>3</sub> and molecular weight of 82). See, for example, US Patent Nos. 5,514,200 & 5,830,255 to Lovatt; US Patent No. 5,707,418 to Hsu; US Patent No. 5,800,837 to Taylor. These describe formulations containing phosphorous acid or phosphonates suitable as fertilisers 15 for plants. It has also been shown that phosphonate compounds are useful as fungicides, especially where the fungal organisms are phycomycetes or oomycetes. See, for example, US Patent Nos. 4,075,324 & 4,119,724 to Thizy; US Patent No. 4,139,616 to Lacroix et al; US Patent Nos. 4,698,334, 4,806,445 & 5,169,646 to Horriere et al; US Patent Nos 4,935,410 & 5,070,083 to Bartlet; US 20 Patent No. 5,736,164 to Taylor. These describe formulations, containing phosphorous acid or phosphonates, suitable as fungicides for plants.

Ammonium thiosulphate and potassium thiosulphate, either alone or mixed with other liquid fertiliser components, have been used for many years as fertilisers. See literature on "Thio-sul"® and KTS® sulphur fertilisers produced 25 by Tessenderlo Kerley. See also UK Patent No. GB 2,259,912 to Sampson, which describes the use of ammonium thiosulphate in a plant growth stimulator.

WPI Abstract Accession No. 91-249421 discloses a cut flower preserving agent comprising a water-soluble silver salt (100 pts. wt.) and thiosulphate (300-2500 pts. wt.) to which a phosphite (30-300 pts. wt.) is added as a stabilising 30 agent.

Some of the problems with the prior art are that the fertilising effect of phosphonate is less than might be expected from the amount of phosphorus applied, and the fungicidal effect is fairly limited in terms of the types of pathogen controlled. This is due to a complex mode of action involving a combination of some fungistatic action and natural plant defences coming into play (See Guest D I & Grant B R (1991) - The Complex action of phosphonates in plants - Biological Reviews 66, 159-187). The use of phosphonate, whilst improving the resistance of plants to infections of downy mildew (eg Plasmopora) and Phytophthora diseases, does tend to increase the risk of ascomycete (eg Erysiphe) infections. The present invention seeks to provide a solution to these problems.

According to one aspect of the present invention there is provided a fertiliser composition comprising at least one phosphonate and at least one thiosulphate.

According to another aspect of the present invention there is provided a fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, derivative, or salt thereof.

According to yet another aspect of the present invention there is provided a fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, derivative, or salt thereof.

According to a further aspect of the present invention there is provided a fertiliser composition comprising at least one thiosulphate, at least one phosphonate and at least one salicylic acid, homologue, derivative, or salt thereof.

The present invention comprises using a mixture of a phosphonate together with either a thiosulphate, or at least one salicylic acid, homologue, derivative, or salt thereof. The use of this combination shows a synergistic effect, in that the combination of phosphonate with thiosulphate or salicylic acid, homologues, salts or derivatives thereof produces a greater fertiliser effect and fungicidal effect than the individual components used separately. There may be

an even greater effect if all three components (ie phosphonate, thiosulphate and salicylic acid, homologue, salt or derivative thereof) were used together. The combination of thiosulphate with a salicylic acid, homologue, salt or derivative thereof, in the absence of phosphonate, also produces a fertiliser effect and fungicidal effect.

Fertilisers based on the present invention provide a greater growth effective response than phosphonates or thiosulphates alone and the degree of fungicidal protection or resistance is broader than that achieved with phosphonates or thiosulphates alone. Plants treated with the present invention suffer less from phycomycete diseases (for example *phytophthoras* and downy mildews) than those treated with for example phosphonate alone and are also less prone to other parasitic fungi such as powdery mildews. Thus the present invention provides a means for applying a single product to plants which is an effective fungicide as well as an effective fertiliser.

Another advantage of the present invention is that the formulation is very storage stable, for example tests on mixtures of potassium phosphonate and ammonium thiosulphate stored for over one year have shown that there is no oxidation of the phosphonate to phosphate and the stored material shows no signs of cloudiness or precipitation. The use of further organic acids as buffers (as in required in US Patent Nos. 5,514,200 & 5,830,255) is also not required to achieve stable solutions.

By "phosphonate" we mean a salt of phosphonic acid ( $H_3PO_3$ ). Phosphonates contain the trivalent  $\equiv PO_3$  radical. For the avoidance of doubt, phosphonic acid is sometimes referred to as phosphorous acid and its salts as phosphites. Mixtures of phosphonates may be employed.

The phosphonate may be any metal ion or other cation which forms such a salt. As phosphonic acid has a P-H bond it forms a mono and di series of salts. Both mono and di salts and mixtures thereof may be used in the present invention. Preferably the phosphonate is an ammonium phosphonate or alkali phosphonate. Amongst the alkali phosphonates, sodium or potassium

phosphonate are preferred. Potassium phosphonate is particularly preferred, in the form of mono- and/or di-potassium phosphonate ( $\text{KH}_3\text{PO}_3$ ,  $\text{K}_2\text{HPO}_3$  respectively).

Phosphonates may be produced by the neutralisation of phosphonic acid by an alkali. The present invention also encompasses the use of phosphonic acid which is subsequently converted to its phosphonate; this conversion may take place in situ or ex situ. When using, for example, potassium hydroxide for the neutralisation, depending on the molar ratio of potassium hydroxide to phosphorous acid, the phosphonate solution will contain varied amounts of di-potassium phosphonate, mono-potassium phosphonate and un-reacted phosphorous acid. We have found that an approximately 42% w/w solution, having a pH of between 6.7 and 7.3 and containing approximately equal amounts of mono- and di-potassium phosphonate is a clear, colourless and very stable starting material for our present invention.

The thiosulphate may be any suitable salt of a metal or other cation. Preferably the thiosulphate is ammonium, sodium or potassium thiosulphate or a mixture thereof. More preferably the thiosulphate is in the form of either ammonium or potassium thiosulphate ( $(\text{NH}_4)_2\text{S}_2\text{O}_3$  or  $\text{K}_2\text{S}_2\text{O}_3$ ).

The most common form of thiosulphate is ammonium thiosulphate, and this is readily available commercially as a 60% w/w solution, with a pH of about 7.5 and a specific gravity of about 1.32. If a higher proportion of potassium is required in the final foliar fertiliser, the ammonium thiosulphate can be substituted, either partly or wholly, with potassium thiosulphate.

The present invention includes functional homologues and derivatives of salicylic acid and its salts. By this we mean that the functional homologue or derivative should be capable of providing a fertiliser effect and/or antifungal effect. Examples of such derivatives of salicylic acid include salicylamide or a salt thereof, and esters.

Examples of homologues of salicylic acid include benzoic acid or a salt or derivative thereof, such as an ester. Examples of benzoic acid compounds which may be used in the present invention may be found in WO99/25191.

The salicylic acid is preferably in the form of its potassium salicylate salt  
5 or salicylamide -  $C_7H_5KO_3$  or  $C_7H_7NO_2$ .

Salicylic acid itself has low solubility, but inorganic salts of salicylic acid, such as sodium or potassium salicylate are readily soluble. When salicylamide is used, rather than salicylic acid or a salicylate, the addition of a few drops of alkali assists in its solution, by forming for example sodium or potassium salicylamide.

10 Salicylamide also dissolves more readily in the thiosulphate solution, the presence of small amounts of alkali or ammonia in the thiosulphate solution assisting in the solubilisation.

The preparation of the compounds used in the present invention is well known in the art. The compounds may be prepared in situ or ex situ.

15 In one embodiment, the composition of the present invention does not include a water-soluble silver salt. In another embodiment, if the composition contains a solution of 100 parts by weight water-soluble silver salt, and 300-2500 parts by weight thiosulphate, then the amount of phosphonate is other than 30 to 300 parts by weight

20 The compositions of the present invention are useful as fertiliser, particularly foliar fertilisers. More particularly the compositions of the present invention increase plant growth compared to the individual components alone, stimulate growth in plants, plant vigour and/or effect crop yield, for example by reducing tuber blight.

25 The compositions of the present invention also have an antifungal effect. This may be a fungicidal or fungistatic effect. The compositions of the present invention may have activity against parasitic fungi. The compositions may have activity against phycomycete diseases such as *phytophthora*s and downy mildews, for example, *Plasmopora*; and/or ascomycetes such as, for example,  
30 *Erysiphe*.

## 6

In one particularly preferred embodiment the composition further comprises further a plant growth regulator. Preferably the plant growth regulator is chlormequat.

In order to apply the composition to the plant or environs of the plant, the 5 composition may be used as a concentrate or more usually is formulated into a composition which includes an effective amount of the composition of the present invention together with a suitable inert diluent, carrier material and/or surface active agent. Preferably the composition is in the form of an aqueous solution which may be prepared from the concentrate. By effective amount we 10 mean that the composition (and/or its individual components) provides a fertilising and/or antifungal effect. Preferably an effective amount of the components is a concentration of up to about 4M phosphonate, up to about 5M thiosulphate and/or up to about 0.8M salicylate. Thus, in one embodiment the concentrate may comprise up to about 10M of the components. The concentrate 15 formulation may for example be diluted at ratios of concentrate to water of about 1:40 to 1:600, and generally is formulated to have pH of about 6.5 to 8.5. At a 1:40 dilution, a concentrate of about 10M would give rise to an application concentrate of up to about 0.25M.

The rate and timing of application will depend on a number of factors 20 known to those skilled in the art, such as the type of species etc.

The composition is generally applied in an amount of from 0.01 to 10kg per hectare, preferably 0.1 to 6kg per hectare. Preferably the phosphonate is applied at 150 g/ha to 2 kg/ha. Preferably the thiosulphate is applied at 250 g/ha to 6 kg/ha. Preferably the salicylic acid, a homologue, derivative, or salt thereof 25 is applied at 1 g/ha to 100 g/ha.

In one preferred embodiment, a fertiliser composition according to the present invention comprises about 150 g/l phosphonate, about 275 g/l thiosulphate and/or about 10 g/l salicylamide. Preferably the phosphonate comprises about 75 g/l mono-potassium phosphonate and about 75 g/l di-potassium phosphonate. 30

As well as varying amounts of each compound to be blended together, as is common with many foliar fertilisers, it is also possible to combine other fertilising elements, such as but not limited to, iron, copper, boron and molybdenum (often known as micronutrients) in the final solution. These may be 5 added as soluble inorganic compounds (eg sodium borate or sodium molybdate) or as chelates (eg copper EDTA) or other metal complexes.

The compositions of the present invention can be applied to the soil, plant, seed, or other area to be protected. Preferably the present invention is applied to the foliage of plants. The composition may be applied in the form of 10 dusting powders, wettable powders, granules (slow or fast release), emulsion or suspension concentrates, liquid solutions, emulsions, seed dressings, or controlled release formulations such as microencapsulated granules or suspensions, soil drench, irrigation component, or preferably a foliar spray.

Dusting powders are formulated by mixing the active ingredient with one 15 or more finely divided solid carriers and/or diluents, for example natural clays, kaolin, pyrophyllite, bentonite, alumina, montmorillonite, kieselguhr, chalk, diatomaceous earths, calcium phosphates, calcium and magnesium carbonates, sulfur, lime, flours, talc and other organic and inorganic solid carriers.

Granules are formed either by absorbing the active ingredient in a porous 20 granular material for example pumice, attapulgite clays, fuller's earth, kieselguhr, diatomaceous earths, ground corn cobs, and the like, or on to hard core materials such as sands, silicates, mineral carbonates, sulfates, phosphates, or the like. Agents which are commonly used to aid in impregnation, binding or coating the 25 solid carriers include aliphatic and aromatic petroleum solvents, alcohols, polyvinyl acetates, polyvinyl alcohols, ethers, ketones, esters, dextrans, sugars and vegetable oils, with the active ingredient. Other additives may also be included, such as emulsifying agents, wetting agents or dispersing agents.

Microencapsulated formulations (microcapsule suspensions CS) or other 30 controlled release formulations may also be used, particularly for slow release over a period of time, and for seed treatment.

Alternatively the compositions may be in the form of liquid preparations to be used as dips, irrigation additives or sprays, which are generally aqueous dispersions or emulsions of the active ingredient in the presence of one or more known wetting agents, dispersing agents or emulsifying agents (surface active agents). The compositions which are to be used in the form of aqueous dispersions or emulsions are generally supplied in the form of an emulsifiable concentrate (EC) or a suspension concentrate (SC) containing a high proportion of the active ingredient or ingredients. An EC is an homogeneous liquid composition, usually containing the active ingredient dissolved in a substantially non-volatile organic solvent. An SC is a fine particle size dispersion of solid active ingredient in water. To apply the concentrates they are diluted in water and are usually applied by means of a spray to the area to be treated.

Suitable liquid solvents for ECs include methyl ketone, methyl isobutyl ketone, cyclohexanone, xylenes, toluene, chlorobenzene, paraffins, kerosene, white oil, alcohols (for example, butanol), methylnaphthalene, trimethylbenzene, trichloroethylene, N-methyl-2-pyrrolidone and tetrahydrofurfuryl alcohol (THFA).

These concentrates are often required to withstand storage for prolonged periods and after such storage, to be capable of dilution with water to form aqueous preparations which remain homogeneous for a sufficient time to enable them to be applied by conventional spray equipment. The concentrates may contain 1-85% by weight of the active ingredient or ingredients. When diluted to form aqueous preparations such preparations may contain varying amounts of the active ingredient depending upon the purpose for which they are to be used.

The composition may also be formulated as powders (dry seed treatment DS or water dispersible powder WS) or liquids (flowable concentrate FS, liquid seed treatment LS), or microcapsule suspensions CS for use in seed treatments. The formulations can be applied to the seed by standard techniques and through conventional seed treaters. In use the compositions are applied to the plants, to

the locus of the plants, by any of the known means of applying fertiliser compositions, for example, by dusting, spraying, or incorporation of granules.

When the final solution is to be applied to plants which, because of their hairy or waxy surface, may be difficult to wet, it may also be advantageous to 5 include other additives, commonly known in the agrochemical industry, such as surfactants, wetting agents, spreaders and stickers. (Examples of wetting agents include silicone surfactants, nonionic surfactants such as alkyl ethoxylates, anionic surfactants such as phosphate ester salts and amphoteric or cationic surfactants such as fatty acid amido alkyl betaines).

10 As indicated above, the compounds of the invention may be the sole active ingredient of the composition or they may be admixed with one or more additional active ingredients such as nematicides, insecticides, synergists, herbicides, additional fungicides, additional fertilisers or plant growth regulators where appropriate.

15 As indicated above, the fertilisers produced according to this present invention are usually applied to the foliage of plants but may also be applied to the soil or added to the irrigation water. The fertilisers may be used advantageously on many types of agricultural and horticultural crops, including but not limited to, cereals, legumes, brassicas, cucurbits, root vegetables, sugar 20 beet, grapes, citrus & other fruit trees and soft fruits. More particularly, crops that will benefit from the fertiliser include, but are not limited to, peas, oil seed rape, carrots, spring barley, avocado, citrus, mango, coffee, deciduous tree crops, grapes, strawberries and other berry crops, soybean, broad beans and other commercial beans, corn, tomato, cucurbitis and other cucumis species, lettuce, 25 potato, sugar beets, peppers, sugar cane, hops, tobacco, pineapple, coconut palm and other commercial and ornamental palms, rubber and other ornamental plants.

Various further preferred features and embodiments of the invention will now be described by reference to the following non-limited Examples.

Example 1

## Solution 1

- An aqueous solution containing a total of 30% by weight of mono and di-potassium phosphonate in roughly equal proportions.

## Solution 2

An aqueous solution containing 55% by weight of ammonium thiosulphate ("ATS").

## Solution 3

- 10 An aqueous solution containing 20 grams per litre of potassium salicylamide.

## Solution 4

- An aqueous solution containing 75 g/L mono potassium phosphonate, 75 g/L di-potassium phosphonate, 275 g/L ammonium thiosulphate and 10 g/L potassium salicylamide.

15 These solutions were applied to lettuce plants, both alone and in combination, and the applications were repeated after a 10 day interval. There were five replicates of each treatment and the results are presented as means of the five replicates. Five plants were also left unsprayed as an untreated control to 20 the other treatments. After eight, twelve, sixteen and twenty-one days, the plants were examined for disease.

**Table 1. Powdery Mildew Score (0 - 9, where higher number equals greater degree of disease)**

<b>Treatment</b> (Applied initially and repeated 10 days later)	<b>Days after first spray</b>		
	<b>8 days</b>	<b>12 days</b>	<b>16 days</b>
Untreated	4.0	6.6	7.2
Solution 1 (1L/ha)	0.8	2.2	3.6
Solution 2 (1L/ha)	1.0	1.2	2.4
Solution 3 (1L/ha)	1.6	3.2	4.2
Solution 1 (1L/ha) + Solution 2 (1L/ha)	0.0	0.4	1.0
Solution 1 (1L/ha) + Solution 3 (1L/ha)	0.4	0.6	1.0
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	0.8	0.6	0.6

5 Table 1 shows the synergistic effect on disease levels achieved by adding Solutions 1 & 2 (phosphonate + ATS) and between Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together. Disease levels were reduced from a mean of 7.2 to a mean of 0.6

10 As well as assessing disease levels, the growth of the plants was assessed by measuring the mean plant diameters after 35 days growth and by measuring the mean above ground fresh and dry weights.

**Table 2. Plant Growth after treatment with the example solutions**

Treatment (Applied initially and repeated 10 days later)	Amount of Rooting (0-9, 0= least rooting) - mean	Plant Diameter (mm) -mean	Above-Ground Fresh Weight (g) – mean	Above-Ground Dry Weight (g) – mean
Untreated	5.3	124	102.3	8.3
Solution 1 (1L/ha)	6.0	148	116.3	9.3
Solution 2 (1L/ha)	5.3	160	109.0	8.7
Solution 3 (1L/ha)	4.7	150	104.7	8.5
Solution 1 (1L/ha) + Solution 2 (1L/ha)	6.7	144	119.0	9.5
Solution 1 (1L/ha) + Solution 3 (1L/ha)	6.7	170	120.7	9.7
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	6.7	168	131.7	10.6

- 5 Table 2 shows the synergistic effect on plant growth caused by adding Solutions 1 & 2 (phosphonate + ATS), Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together.

The abbreviations used in the following Examples A-E are:

- A = phosphonate + thiosulphate
- B = phosphonate + salicylate/salicylamide
- 5 C = thiosulphate + salicylate/salicylamide
- D = thiosulphate + salicylate/salicylamide + phosphite
- E = thiosulphate + salicylate + chlormequat

KP40 = 40% potassium phosphonate

10 KT47 = 47% potassium thiosulphate (w/v)

KS20 = 20% potassium salicylate (w/v)

CS8 = salicylamide (20g/l)

AT60 = 60% ammonium thiosulphate

PF723 = 55% ammonium thiosulphate

15

Examples A

Solution 1 = KP40 at 0.75 l/ha every 10 days

Solution 2 = PF723 at 1.0 l/ha every 10 days

20

**Table A1**

Percent Powdery Mildew - Lettuce

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray		
	8 Days	12 Days	16 Days
Untreated	40	66	72
Solution 1 (1L/Ha)	8	22	36
Solution 2 (1L/Ha)	10	12	24
Solution 1 (1L/Ha) + Solution 2 (1L/Ha)	0	4	10

**Table A2****Percent Powdery Mildew and Fertiliser Attributes – Sugar Beet**

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray		Above Ground Fresh Weight (g) - Mean (x 1 Rate)
	+ 28 Days (x 1 Rate)	+ 35 Days (x 1 Rate)	
Untreated	22	31	144.7
Solution 1	6	4	152.3
Solution 2	2	2	153.3
Solution 1 + Solution 2	0	0	154.3

**Table A3****Fertiliser Attributes – Spring Barley**

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) + 35 Days (x 1 Rate)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)	Amount of Above Ground Tissue (0-9) at Harvest (x 1 Rate)
Untreated	5.6	68.8	7.7	5.0
Solution1	5.6	67.0	7.4	5.3
Solution 2	5.4	68.3	7.2	5.3
Solution 1 + Solution 2	6.6	72.7	7.9	6.0

15

**Table A4**  
**GRAPE TRIAL**  
**Percent Powdery Mildew**

Treatment (Applied initially and repeated at 10 day intervals)	Days After First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	7.3	9.3	11.3	14.0	14.0
KP40 @ 0.75 l/ha	5.3	6.7	8.0	11.3	10.7
PF723 @ 1.0 l/ha	2.7	7.3	7.3	8.0	6.7
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha	1.3	5.3	6.0	6.0	5.3

**Table A5**  
**LETTUCE TRIAL**  
**Percent Powdery Mildew**

Treatment (Applied initially and repeated at 10 day intervals)	Days After First Spray		
	+ 16 Days	+ 20 Days	+ 24 Days
Untreated	10.0	16.7	24.7
KP40 @ 0.75 l/ha	7.3	12.0	16.0
PF723 @ 1.0 l/ha	8.0	12.0	15.3
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha	5.3	8.7	14.0

**Table A6****Broad Bean – Fertiliser Attributes**

(KP40 = 40% Potassium Phosphite; PF723 = 55% Ammonium Thiosulphate)

Treatment (2 Applications in total - every 15 days)	Above Ground Fresh Weight (g) - Mean	Above Ground Dry Weight (g) - Mean
Untreated	143.8	14.6
KP40 (5.0 l/ha) + PF723 (0.5 l/ha)	150.7	15.5
KP40 (3.0 l/ha) + PF723 (0.5 l/ha)	160.3	16.1
KP40 (5.0 l/ha) + PF723 (1.0 l/ha)	168.0	17.3
KP40 (3.0 l/ha) + PF723 (1.0 l/ha)	161.3	16.8

**Table A7**  
**Sugar Beet**

**Percent Powdery Mildew and Fertiliser Attributes**

(KP40 = 40% Potassium Phosphate; AT60 = 60% Ammonium Thiosulphate)

Treatment (2 Applications in total - every 15 days)	Days After First Spray		Root Fresh Weight (g) - Mean	Root Dry Weight (g) - Mean	Above Ground Fresh Weight (g) - Mean	Above Ground Dry Weight (g) - Mean
	+ 24 Days	+ 28 Days				
Untreated	14	24	83.0	12.2	137.8	15.3
KP40 (0.375 l/ha) + AT60 (10.0 l/ha)	0	4	90.3	12.9	142.3	15.3
KP40 (0.75 l/ha) + AT60 (10.0 l/ha)	0	2	91.7	13.9	145.0	16.4
KP40 (0.375 l/ha) + AT60 (6.0 l/ha)	0	0	82.7	12.4	144.0	16.5
KP40 (0.75 l/ha) + AT60 (6.0 l/ha)	0	0	97.7	13.6	145.3	15.5
KP40 (3.75 l/ha) + AT60 (10.0 l/ha)	0	6	89.7	13.2	144.0	15.8
KP40 (2.5 l/ha) + AT60 (10.0 l/ha)	2	8	89.7	14.0	143.3	15.4
KP40 (2.5 l/ha) + AT60 (6.0 l/ha)	0	4	98.0	13.9	146.7	16.1

**Table A8**  
**Sugar Beet**  
**Percent Powdery Mildew and Fertiliser Attributes**

(KP40 = 40% Potassium Phosphate; AT60 = 60% Ammonium Thiosulphate)

Treatment (2 Applications in total - every 15 days)	Days After First Spray		Root Fresh Weight (g) - Mean	Root Dry Weight (g) - Mean	Above Ground Fresh Weight (g) - Mean	Above Ground Dry Weight (g) - Mean
	+ 24 Days	+ 28 Days				
Untreated	22	28	109.7	13.3	144.7	14.7
KP40 (0.375 l/ha) + AT60 (10.0 l/ha)	0	2	110.3	13.2	149.7	15.5
KP40 (0.75 l/ha) + AT60 (10.0 l/ha)	0	2	118.7	13.8	147.7	15.1
KP40 (0.375 l/ha) + AT60 (6.0 l/ha)	0	6	117.7	13.6	151.3	15.0
KP40 (0.75 l/ha) + AT60 (6.0 l/ha)	2	2	113.7	13.7	150.7	15.2
KP40 (3.75 l/ha) + AT60 (10.0 l/ha)	0	0	119.0	14.2	150.7	15.0
KP40 (2.5 l/ha) + AT60 (10.0 l/ha)	2	0	117.3	14.7	148.7	15.0
KP40 (2.5 l/ha) + AT60 (6.0 l/ha)	2	2	119.7	14.0	154.3	15.6

Examples B

Solution 1 = KP40 at 0.75 l/ha

Solution 3 = CS8 at 1.0 l/ha

5

**Table B1****Fertiliser Attributes – Strawberry**

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) + 28 Days (x 1 Rate)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)
Untreated	4.8	50.8	5.0
Solution1	5.6	53.7	5.1
Solution 3	6.0	56.0	5.6
Solution 1 + Solution 3	6.4	63.0	6.2

**Table B2****Fertiliser Attributes – Spring Barley**

Treatment (Applied initially and repeated after a 10 day interval)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)	Amount of Above Ground Tissue (0.9) (x 1 Rate)
Untreated	77.3	8.6	5.0
Solution 1	78.3	8.7	5.3
Solution 3	75.0	8.4	5.3
Solution 1 + Solution 3	81.7	9.7	5.7

**Table B3****Percent Powdery Mildew – Sugar Beet**

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray	
	+ 28 Days (x 1 Rate)	+ 32 Days (x 1 Rate)
Untreated	23	35
Solution 1	6	18
Solution 3	12	20
Solution 1 + Solution 3	0	12

Table B4

## Fertiliser Attributes – Spring Barley

Treatment (Applied initially and repeated after a 10 day interval)	Amount of Rooting (0-9) (x 1 Rate)	Amount of Above Ground Tissue (0-9) (x 1 Rate)
Untreated	5.2	5.0
Solution 1	5.3	5.7
Solution 3	6.0	5.7
Solution 1 + Solution 3	6.3	6.0

Table B5

## Powdery Mildew - Grape

Treatment (Applied initially and repeated at 10 day intervals)	Days After First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	7.3	9.3	11.3	14.0	14.0
KP40 @ 0.75 l/ha	5.3	6.7	8.0	11.3	10.7
KS20 @ 1.0 l/ha	5.3	6.7	8.0	11.3	9.3
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	1.3	2.7	4.0	5.3	4.7
					4.7

**Table B6**

Treatment (Applied Initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	4.67	121.3	106
KS20 @ 1.0 l/ha	3.3	255.6	5.07	129.6	113
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	5.67	151.6	133

**Table B7**

Treatment (Applied initially & repeated at 10 day intervals)	Days after First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	5.3	8.7	12.7	12.7	18.7
KP40 @ 0.75 l/ha	2.7	3.3	6.7	8.7	9.3
KS20 @ 1.0 l/ha	2.0	4.0	5.3	8.0	10.0
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	1.3	1.3	2.0	2.7

Examples C

Solution 2 = PF723 at 1.0 l/ha every 10 days  
 Solution 3 = CS8 at 1.0 l/ha every 10 days

Table C1

Percent Powdery Mildew - Grape

Treatment (Applied Initially and repeated at 10 day intervals)	Days After First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Unreated	7.3	9.3	11.3	14.0	14.0
KT47 @ 1.5 l/ha	4.7	6.7	8.0	9.3	9.3
KS20 @ 1.0 l/ha	5.3	6.7	8.0	11.3	9.3
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	2.7	5.3	6.7	8.7	7.3

Table C2

Fertiliser Attributes - Broad Bean

Treatment (Applied initially and repeated after a 10 day interval)	Amount of Rooting (0-9) (x 1 Rate)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)
Unreated	5.3	143.8	14.6
Solution 2	5.3	155.7	16.1
Solution 3	5.3	155.0	15.7
Solution 2 + Solution 3	5.7	163.3	16.6

**Table C3****Fertiliser Attributes – Peas**

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) + 28 Days (x 1 Rate)	Root Fresh Weight (g) - Mean (x 1 Rate)	Root Dry Weight (g) - Mean (x 1 Rate)	Amount of Above Ground Tissue (0-9) at Harvest (x 1 Rate)
Untreated	6.1	124.2	14.1	5.5
Solution 2	6.2	126.3	15.1	5.3
Solution 3	6.2	125.7	15.1	5.7
Solution 2 + Solution 3	6.4	130.7	15.6	6.0

**Table C4****Fertiliser Attributes – Carrot**

Treatment (Applied initially and repeated after a 10 day interval)	Root Dry Weight (g) - Mean (x 1 Rate)	Amount of Rooting (0-9) (x 1 Rate)	Amount of Above Ground Tissue (0-9) at Harvest (x 1 Rate)
Untreated	5.5	5.2	5.0
Solution 2	6.1	5.3	5.0
Solution 3	6.2	5.0	5.0
Solution 2 + Solution 3	6.4	5.7	5.7

**Table C5**

## Percent Powdery Mildew – Oilseed Rape

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray
	+ 35 Days (x 1 Rate)
Untreated	14
Solution 2	14
Solution 3	14
Solution 2 + Solution 3	8

15    **Table C6**

## Fertiliser Attributes – Sugar Beet

Treatment (Applied initially and repeated after a 10 day interval)	Root Fresh Weight (g) - Mean (x 1 Rate)	Root Dry Weight (g) - Mean (x 1 Rate)
Untreated	109.7	13.3
Solution 2	111.7	13.3
Solution 3	113.7	13.4
Solution 2 + Solution 3	114.7	14.1

**Table C7**

## Fertiliser Attributes - Strawberry

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) + 35 Days (x 1 Rate)	Amount of Rooting (0-9) (x 1 Rate)
Untreated	5.0	5.2
Solution 2	6.0	5.7
Solution 3	6.6	5.3
Solution 2 + Solution 3	7.0	6.0

Examples D

## POTATO TRIAL

Table D1

## % Tuber Blight, Final Yield and Quality

Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Relative Final Tuber Yield (%)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	100	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	107	4.67	121.3d	106d
KT47 @ 1.5 l/ha	2.7	261.7	108	5.27	137.9	121
KS20 @ 1.0 l/ha	3.3	255.6	106	5.07	129.6	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	0.7	271.4	112	5.60	152.0	133
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	111	5.67	151.6	133
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	272.2	113	5.60	152.4	133
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	277.0	115	5.80	160.7	141

Table D2

## POTATO TRIAL

## % Tuber Blight, Yield and Quality Benefits

Treatment (Applied Initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	14.0	256.1	5.80	148.5b	100b
KP40 @ 0.75 l/ha	10.0	271.4	5.73	155.5	105
KT47 @ 1.5 l/ha	9.3	279.2	5.80	161.9	109
KS20 @ 1.0 l/ha	9.3	292.0	5.73	167.3	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	4.0	280.4	5.80	162.6	109
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	4.7	286.3	5.80	166.1	112
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	3.3	290.0	5.87	170.2	115
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	1.3	278.0	6.07	168.7	114

**Table D3**  
**Spring Barley 1999**  
**Percent Powdery Mildew and Fertiliser Attributes**

(KP40 = 40% Potassium Phosphite; CS100 = 10g/litre Salicylamide; CS8 = 20g/l Salicylamide; AT60 = 60% Ammonium Thiosulphate)

Treatment (2 Applications in total - every 15 Days)	Days After First Spray	Plant Health 'Greenness' Score (0-9) + 28 Days	Plant Health 'Greenness' Score (0-9) + 35 Days	Amount of Rooting (0-9) - Mean	Above Ground Fresh Weight (g) - Mean	Above Ground Dry Weight (g) - Mean	Amount of Above Ground Tissue (0-9) - Mean
	+ 20 Days						
Untreated	7	5.4	5.6	5.3	68.8	7.7	5.0
KP40 (0.375 l/ha) + CS100 (1.0 l/ha)	2	5.8	6.0	6.0	72.7	8.4	5.3
KP40 (0.75 l/ha) + CS100 (1.0 l/ha)	2	6.0	6.2	5.3	72.0	8.2	5.0
KP40 (0.375 l/ha) + CS100 (0.5 l/ha)	2	5.8	5.4	6.0	75.3	8.5	5.7
KP40 (0.75 l/ha) + CS100 (0.5 l/ha)	4	5.6	5.8	6.3	68.7	7.5	5.3
KP40 (0.375 l/ha) + CS100 (1.0 l/ha) + AT60 (10.0 l/ha)	2	5.4	6.0	6.7	69.7	8.0	6.0
KP40 (0.375 l/ha) + CS100 (0.5 l/ha) + AT60 (10.0 l/ha)	2	5.6	6.2	6.0	68.7	7.9	5.7
KP40 (0.375 l/ha) + CS100 (0.5 l/ha) + AT60 (6.0 l/ha)	4	5.8	5.6	6.0	62.0	7.4	5.0
KP40 (0.375 l/ha) + CS8 (0.05 l/ha) + AT60 (10.0 l/ha)	0	5.2	5.4	6.0	69.0	7.8	5.3
KP40 (0.375 l/ha) + CS8 (0.25 l/ha) + AT60 (6.0 l/ha)	2	6.0	5.6	6.7	67.7	7.5	5.0
KP40 (0.375 l/ha) + CS8 (0.25 l/ha) + AT60 (10.0 l/ha)	0	5.4	5.0	5.7	69.7	7.4	5.0
KP40 (0.375 l/ha) + CS8 (0.25 l/ha) + AT60 (6.0 l/ha)	0	6.0	5.3	6.0	69.3	7.5	5.0

**Table D4**  
**Spring Barley**

**Percent Powdery Mildew and Fertiliser Attributes**

(KP40 = 40% Potassium Phosphite; CS100 = 10g/litre Salicylamide; CS8 = 20g/l Salicylamide; AT60 = 60% Ammonium Thiosulphate)

Treatment (2 Applications in total - every 15 Days)	Amount of Rooting (0-9) - Mean	Above Ground Fresh Weight (g) - Mean	Above Ground Dry Weight (g) - Mean	Amount of Above Ground Tissue (0-9) - Mean
Untreated	5.2	73.0	9.1	5.0
KP40 (0.375 l/ha) + CS100 (1.0 l/ha)	6.0	83.0	9.3	5.3
KP40 (0.75 l/ha) + CS100 (1.0 l/ha)	5.7	82.0	9.7	5.3
KP40 (0.375 l/ha) + CS100 (0.5 l/ha)	5.0	77.7	8.6	6.0
KP40 (0.75 l/ha) + CS100 (0.5 l/ha)	6.0	76.7	8.7	5.0
KP40 (0.375 l/ha) + CS100 (1.0 l/ha) + AT60 (10.0 l/ha)	6.0	67.3	7.8	5.0
KP40 (0.375 l/ha) + CS100 (0.5 l/ha) + AT60 (10.0 l/ha)	6.0	68.3	8.1	5.0
KP40 (0.375 l/ha) + CS100 (0.5 l/ha) + AT60 (6.0 l/ha)	6.0	78.3	9.1	5.7
KP40 (0.375 l/ha) + CS8 (0.05 l/ha) + AT60 (10.0 l/ha)	5.7	76.0	8.8	5.7
KP40 (0.375 l/ha) + CS8 (0.05 l/ha) + AT60 (6.0 l/ha)	6.0	78.3	9.0	5.7
KP40 (0.375 l/ha) + CS8 (0.25 l/ha) + AT60 (10.0 l/ha)	5.0	71.7	8.5	5.3
KP40 (0.375 l/ha) + CS8 (0.25 l/ha) + AT60 (6.0 l/ha)	5.7	72.0	8.1	5.0

**LETUCE TRIAL**

**Table D5**

**Fresh Weight Yield and Quality Benefits**

(KP40 = 40% Potassium Phosphate; PF723 = 55% Ammonium Thiosulphate; KS20 = 20 gms/litre Potassium Saliicylate)

Treatment (Applied Initially and repeated at 10 day intervals)	Final Fresh Weight Yield (g)	Quality of Final Fresh Weight Yield (0.8)	Final Fresh Weight Quality Yield (g)	Relative Fresh Weight 'Quality' Yield (%)	Median Final Fresh Weight Yield (g)	Median Quality of Final Fresh Weight Yield (0.9)	Median Final Fresh Weight 'Quality' Yield (g)	Relative Median Fresh Weight 'Quality' Yield (%)
Untreated	81.3	5.33	43.4C	100C	80.6	5.27	42.5	100
KP40 @ 0.75 l/ha	85.0	5.40	45.7	105	87.2	5.36	46.7	110
PF723 @ 1.0 l/ha	87.7	5.40	47.4	109	88.6	5.48	47.3	111
KS20 @ 1.0 l/ha	83.6	5.67	47.4I	109I	82.8	5.64	46.6	110
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha	89.8	5.63	50.6	117	89.8	5.64	50.6	118
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	90.9	5.53	50.3	116	90.6	5.64	51.1	120
PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	86.5	5.67	49.0	113	85.4	5.64	48.2	113
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	87.9	5.67	49.8	115	88.4	5.64	49.9	117

Examples E**Table E1**

5 Benefits of Ammonium Thiosulphate (ATS) and Potassium Salicylate (KS) with  
Chlormequat (CCC) on Spring Barley

Treatment (Treatments applied at 3 leaves stage)	Powdery Mildew (%) at + 15 days	Amount of Rooting (0-9) Mean of 10 plants	Above Ground Fresh Weight (g) Total of 10 plants	Above Ground Dry Weight (g) Total of 10 plants
Untreated	25	5.8	30.5	3.4
CCC (1.25 l/ha)	15	5.5	34.0	3.7
CCC (1.25 l/ha) + ATS (1.25 l/ha)	13	6.0	31.5	3.6
CCC (1.25 l/ha) + KS (20 g/ha)	18	6.0	31.3	3.5
CCC (1.25 l/ha) + ATS (1.25 l/ha) + KS (20 g/ha)	8	6.5	36.0	4.0

**Table E2**

Benefits of Ammonium Thiosulphate (ATS) and Potassium Salicylate (KS) with Chlormequat (CCC) on Spring Barley

<b>Treatment (Treatments applied at 3 leaves stage (T1) and prior to start of stem extension (T2))</b>	<b>Powdery Mildew (%) at + 12 days</b>	<b>Powdery Mildew (%) at + 15 days</b>	<b>Powdery Mildew (%) at + 18 days</b>	<b>Number of Tillers Initiated per Plant (mean of 10 plants)</b>
Untreated	20	25	38	3.0
CCC (0.8 l/ha at T1 & T2)	8	8	10	3.5
CCC (0.8 l/ha at T1 & T2) + ATS (0.8 l/ha at T1 & T2)	5	5	8	3.5
CCC (0.8 l/ha at T1 & T2) + KS (20 g/ha at T1 & T2)	8	8	13	3.3
CCC (0.8 l/ha at T1 & T2) + ATS (0.8 l/ha at T1 & T2) + KS (20 g/ha at T1 & T2)	0	3	5	4.3

The following show non-limiting examples of formulated compositions in accordance with the present invention

### FOLIAR FERTILISER ONE

INGREDIENTS	Specific Gravity	Kilogram percentage per batch	Volume per batch of ingredient	gram/litre of active
	w/w	w/w	gram/litre	of active
Water	1.000	150.0000	7.50000	150.0000
Wetting agent	1.000	10.0000	0.50000	10.0000
Salicylic Acid	1.000	10.0000	0.50000	10.0000
Potassium hydroxide (20% w/w)	1.200	130.0000	6.50000	108.3333
Copper EDTA chelate (14.3 % Cu w/w)	1.200	30.0000	1.50000	25.0000
Iron EDTA chelate (13.2 % Fe w/w)	1.200	30.0000	1.50000	25.0000
Pot. phosphites (42%w/w)	1.342	1,000.0000	50.00000	745.1565
Ammonium thiosulphate (60% w/w)	1.320	640.0000	32.00000	484.8485
Totals		2,000.0000	100.00000	1,558.3383
				1,283.4184
				746.9495
N		3.84	% w/w	49 g/litre w/v
P		4.68	% w/w	60 g/litre w/v
P as $P_2O_5^{**}$		10.64	% w/w	137 g/litre w/v
K		9.91	% w/w	125 g/litre w/v
K as $K_2O$		11.93	% w/w	150 g/litre w/v
S		8.32	% w/w	107 g/litre w/v
S as $SO_3$		20.80	% w/w	267 g/litre w/v
** theoretically				

**FOLIAR FERTILISER TWO**

INGREDIENTS	Specific Gravity	Kilogram percentage per batch w/w	Volume per batch of ingredient	gram/litre of active
Water	1.000	150.0000	150.0000	96.2564
Wetting agent	1.000	10.0000	10.0000	6.4171
Zinc EDTA chelate (15.7% Zn w/w)	1.000	30.0000	30.0000	19.2513
Copper EDTA chelate (14.3% Cu w/w)	1.000	30.0000	30.0000	19.2513
Iron EDTA chelate (13.2% Fe w/w)	1.000	30.0000	30.0000	19.2513
Pot. phosphates (42%w/w)	1.342	750.0000	558.8674	481.2819
Ammonium thiosulphate (60% w/w)	1.320	1,000.0000	757.5758	641.7092
<b>Totals</b>		<b>2,000.0000</b>	<b>100.00000</b>	<b>1,566.4431</b>
				<b>1,283.4184</b>
				<b>747.5912</b>
N		6.00 % w/w	77 g/litre w/v	
P		3.51 % w/w	45 g/litre w/v	
P as P <sub>2</sub> O <sub>5</sub> **		7.98 % w/w	102 g/litre w/v	
K		6.96 % w/w	88 g/litre w/v	
K as K <sub>2</sub> O		8.39 % w/w	105 g/litre w/v	
S		13.00 % w/w	167 g/litre w/v	
S as SO <sub>3</sub>		32.50 % w/w	417 g/litre w/v	

\*\* theoretically

The above Examples show that the compositions of the present invention show the desired fertilisation and antifungal effects.

## CLAIMS

1. A fertiliser composition comprising at least one phosphonate and at least one thiosulphate.
2. A fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, derivative, or salt thereof.
- 10 3. A fertiliser composition according to claim 2 further comprising at least one thiosulphate.
4. A fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, derivative, or salt thereof.
- 15 5. A fertiliser composition according to any one of claims 1-3 wherein the phosphonate is ammonium, sodium or potassium phosphonate or a mixture thereof.
- 20 6. A fertiliser composition according to any one of claims 1 and 3-5 wherein the thiosulphate is ammonium, sodium or potassium thiosulphate or a mixture thereof.
- 25 7. A fertiliser composition according to any one of claims 2-6 wherein the derivative of salicylic acid is salicylamide or a salt thereof.
8. A fertiliser composition according to any one of claims 2-6 wherein the homologue of salicylic acid is benzoic acid or a salt or derivative thereof.

9. A fertiliser composition according to any of claims 2-7 wherein the salt of salicylic acid, its homologue or derivative is an organic or inorganic salt.
10. A fertiliser composition according to claim 9 wherein the salt is a sodium or potassium salt or mixtures thereof.
- 5
11. A fertiliser composition according to any preceding claim in the form of a concentrate.
- 10 12. A fertiliser composition according to any one of claims 1-10 in the form of an aqueous solution.
- 15 13. A fertiliser composition according to claim 12 comprising 150 g/l phosphonate, 275 g/l thiosulphate and/or 10 g/l salicylamide.
14. A fertiliser composition according to claim 13 wherein the phosphonate comprises 75 g/l mono-potassium phosphonate and 75 g/l di-potassium phosphonate.
- 20 15. A fertiliser composition according to any preceding claim further comprising a plant growth regulator.
16. A fertiliser composition according to claim 15 wherein the plant growth regulator is chlormequat.
- 25 17. A method for fertilising a plant comprising applying a fertiliser composition according to any preceding claim to the plant or its environs.
18. A method according to claim 17 wherein the phosphonate is applied at
- 30 150 g/ha to 2 kg/ha.

19. A method according to claim 17 or claim 18 wherein the thiosulphate is applied at 250 g/ha to 6 kg/ha.
- 5 20. A method according to any one of claims 17 to 19 wherein at least one salicylic acid, a homologue, derivative, or salt thereof is applied at 1 g/ha to 100 g/ha.
- 10 21. Use of a fertiliser composition according to any one of claims 1-16 to stimulate plant growth.
22. Use of a fertiliser composition according to any one of claims 1-16 to control parasitic fungi.

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(54) Title: PHOSPHONATE OR THIOSULFATE BASED FERTILISERS

(57) Abstract: The present invention provides a liquid fertiliser comprising a mixture of a salt of phosphorous acid together with either a thiosulphate such as ammonium or potassium thiosulphate and/or a salt of salicylic acid or salicyle amide. The use of this combination as a foliar spray, soil drench or irrigation component produces a greater fertiliser effect (on plant vigour and growth) and greater resistance to or control of parasitic fungal diseases, than each of the components applied individually or any combination of just two components.

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## PATENT COOPERATION TREATY

PCT

REC'D 26 JUN 2001

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference  P00294WO CLM	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No.  PCT/GB00/00367	International filing date (day/month/year)  07/02/2000	Priority date (day/month/year)  05/02/1999
International Patent Classification (IPC) or national classification and IPC  C08B17/00		
Applicant  MANDOPS (UK) LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 13 sheets.

3. This report contains indications relating to the following items:

- I    Basis of the report
- II    Priority
- III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV    Lack of unity of invention
- V    Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI    Certain documents cited
- VII    Certain defects in the international application
- VIII    Certain observations on the international application

Date of submission of the demand  04/09/2000	Date of completion of this report  22.06.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  RODRIGUEZ FONTAO, M  Telephone No. +31 70 340 3758



# **INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No. PCT/GB00/00367

## I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):  
**Description, pages:**

**1,2,4,5,7-10,13,  
15-20,23-26,29,30,  
32-35** as originally filed

3,6,11,12,14,21, as received on 30/04/2001 with letter of 27/04/2001  
22,27,28,31

**Claims, No.:**

1-24 as received on 30/04/2001 with letter of 27/04/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
  - the language of publication of the international application (under Rule 48.3(b)).
  - the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
  - filed together with the international application in computer readable form.
  - furnished subsequently to this Authority in written form.
  - furnished subsequently to this Authority in computer readable form.
  - The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
  - The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
  - the claims, Nos.:

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- the drawings,      sheets:
5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*
6. Additional observations, if necessary:

## IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:
- restricted the claims.
- paid additional fees.
- paid additional fees under protest.
- neither restricted nor paid additional fees.
2.  This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- complied with.
- not complied with for the following reasons:
4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:
- all parts.
- the parts relating to claims Nos. 1-4, 7-24.

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes: Claims 1,2
	No: Claims 3-4,7-24
Inventive step (IS)	Yes: Claims 1,2
	No: Claims 3,4,7-24

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Industrial applicability (IA) Yes: Claims 1-4,7-24  
No: Claims

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

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EXAMINATION REPORT - SEPARATE SHEET**

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**R It m IV**

**Lack of unity of invention**

This International Examination Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1,2, 7-24 (partially; as far as dependent on claim 1)

Fertiliser composition comprising at least one phosphonate and at least one thiosulphate, a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

2. Claims: 3,4, 7-24 (partially; as far as dependent on claim 3)

Fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, etc, a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

3. Claims: 5,6,7-24 (partially; as far as dependent on claim 5)

Fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, etc., a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

The application lacks unity of invention as required by Article 3(4)(iii) and 34(3)(a) PCT for the following reasons:

The present application contains the following independent "product" claims. In relation to these claims the following separate inventions were identified:

- I. (Claim 1): A fertiliser composition comprising at least one phosphonate and at least one thiosulphate.
- II. (Claim 3): A fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, derivative or salt thereof.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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III. (Claim 5): A fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, derivative or salt thereof.

Claims 1 and 3 solve the problem of improving the low fertilising effect of phosphonate and its limitations as fungicide when used alone (see application, page 2, first paragraph). The problem appears to be solved by combining the phosphonate with either a thiosulphate or a salicylic acid (homologue, derivative, etc.).

Claim 5 does not mention the presence of phosphonate. Apparently the problem solved by this claim is in relation with the improving of the fertilising and/or antifungal effect of thiosulphate and salicylic acid combinations in relation to the effect of the same compounds used individually.

As both problems and solutions are different, no single general concept can be formulated based on the technical features of the three inventions. No other technical features could be found which could be accepted as special technical features (Rule 13.2 PCT) serving to establish a technical link among all of the different inventions and therefore it is considered that there is no single inventive concept underlying the different inventions of the present application.

In consequence it is established that the requirements of Rule 13.1 PCT are not met and there is lack of unity "prima facie" between the group of inventions of claims 1 and 3 in relation to the invention of claim 5.

Furthermore the common concept derivable from claims 1 and 3, i.e. a composition comprising a phosphonate where the fertiliser and/or antifungal properties of this compound are enhanced by mixing the phosphonate with another component is not new in view of US-A-5865870 (D1)

D1 discloses that phosphorous acid or its salts , in combination with polyphosphoric acid or its salts, when used as plant fertiliser, has a synergistic effect that improves plant growth more than if the same compounds are used individually (see column 2, lines 10-16).

Document D1 is prejudicial for the novelty of the single general concept linking the

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inventions of claim 1 and claim 3. No other technical features could be found which could be accepted as special technical features serving to establish a technical link among the two inventions and therefore the compositions of claim 1 and claim 3 lack unity in view of D1.

**Re Item V**

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: US-A-5865870

D2: US-A-5707418

D3: US-A-5514200

D4: US-A-5795847

D5: US-A-5047078

D6: DD-A-266755

**Independent claim 1**

The subject matter of claim 1 is considered to involve an inventive step (Art 33(3) PCT) in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

Document D1 is considered as the closest prior art. This document describes a phosphorus fertiliser having a combination of phosphorous acid or its salts (phosphonates) with phosphoric acid or its salts.

The difference between the subject-matter of claim 1 and the closest prior art consists in that the claimed fertiliser contains thiosulphate in addition to the phosphonate salt.

The technical effect caused by the inclusion of thiosulphate is a synergistic fertilising effect together with a decreased risk of ascomycete infection (see description, page 2, first paragraph)

The problem to be solved in view of the closest prior art could be considered as an

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improvement of agricultural value of phosphonate.

D4 discloses a herbicidal composition containing additional electrolytes such as phosphite or thiosulphate (see column 9, lines 1-66). The combination of phosphonate with thiosulphate in order to improve the fertiliser activity of the former is not suggested in any of the cited relevant cited documents of the prior art. The subject-matter of claim 1 is therefore considered to involve an inventive step (Art 33(3) PCT)

The subject-matter of claim 1 would also be considered as involving an inventive step if D2 or D3 were considered as closest prior art.

**Independent claim 3**

The subject matter of claim 3 is not new in respect of prior art (Article 33(2) PCT) as defined in the regulations (Rule 64(1)-(3) PCT).

D5 discloses the use of a salicylic acid derivative vinylbenzoic acid in combination with phosphonates to increase the fertiliser activity of compositions containing phosphate (see column 2, line 68 - column 3 line 29). The subject-matter of claim 3 is considered to lack novelty in view of this document.

D6 discloses also a composition containing phosphonate and salicylic acid or derivative (see claim 2) as fertilisers. The subject-matter of claim 3 is considered to lack novelty in view of this document.

The subject-matter of claim 23 lacks also novelty in view of D5 and D6.

The subject-matter of claim 24 lacks also novelty in view of D4

**Re Item VII**

Certain defects in the international application

- a) Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D6 has not been mentioned in the description, nor have these documents been identified therein.

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- b) The independent claims have not been drafted in the two-part form in accordance with Rule 6.3(b) PCT.

**Re Item VIII**

Certain observations on the international application

The expression "salicylic acid, homologue, derivatives or salt thereof" used in claim 3 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT). Furthermore claim 3 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description.

an even greater effect if all three components (ie phosphonate, thiosulphate and salicylic acid, homologue, salt or derivative thereof) were used together. The combination of thiosulphate with a salicylic acid, homologue, salt or derivative thereof, in the absence of phosphonate, also produces a fertiliser effect and fungicidal effect.

Fertilisers based on the present invention provide a greater growth effective response than phosphonates or thiosulphates alone and the degree of fungicidal protection or resistance is broader than that achieved with phosphonates or thiosulphates alone. Plants treated with the present invention suffer less from phycomycete diseases (for example *phytophthoras* and downy mildews) than those treated with for example phosphonate alone and are also less prone to other parasitic fungi such as powdery mildews. Thus the present invention provides a means for applying a single product to plants which is an effective fungicide as well as an effective fertiliser.

Another advantage of the present invention is that the formulation is very storage stable, for example tests on mixtures of potassium phosphonate and ammonium thiosulphate stored for over one year have shown that there is no oxidation of the phosphonate to phosphate and the stored material shows no signs of cloudiness or precipitation. The use of further organic acids as buffers (as is required in US Patent Nos. 5,514,200 & 5,830,255) is also not required to achieve stable solutions.

By "phosphonate" we mean a salt of phosphonic acid ( $H_3PO_3$ ). Phosphonates contain the trivalent  $\equiv PO_3$  radical. For the avoidance of doubt, phosphonic acid is sometimes referred to as phosphorous acid and its salts as phosphites. Mixtures of phosphonates may be employed.

The phosphonate may be any metal ion or other cation which forms such a salt. As phosphonic acid has a P-H bond it forms a mono and di series of salts. Both mono and di salts and mixtures thereof may be used in the present invention. Preferably the phosphonate is an ammonium phosphonate or alkali phosphonate.

Amongst the alkali phosphonates, sodium or potassium

## 6

In one particularly preferred embodiment the composition further comprises a plant growth regulator. Preferably the plant growth regulator is chlormequat.

In order to apply the composition to the plant or environs of the plant, the 5 composition may be used as a concentrate or more usually is formulated into a composition which includes an effective amount of the composition of the present invention together with a suitable inert diluent, carrier material and/or surface active agent. Preferably the composition is in the form of an aqueous solution which may be prepared from the concentrate. By effective amount we mean that the 10 composition (and/or its individual components) provides a fertilising and/or antifungal effect. Preferably an effective amount of the components is a concentration of up to about 4M phosphonate, up to about 5M thiosulphate and/or up to about 0.8M salicylate. Thus, in one embodiment the concentrate may comprise up to about 10M of the components. The concentrate formulation may for 15 example be diluted at ratios of concentrate to water of about 1:40 to 1:600, and generally is formulated to have pH of about 6.5 to 8.5. At a 1:40 dilution, a concentrate of about 10M would give rise to an application concentrate of up to about 0.25M.

The rate and timing of application will depend on a number of factors known 20 to those skilled in the art, such as the type of species etc.

The composition is generally applied in an amount of from 0.01 to 10kg per hectare, preferably 0.1 to 6kg per hectare. Preferably the phosphonate is applied at 150 g/ha to 2 kg/ha. Preferably the thiosulphate is applied at 250 g/ha to 6 kg/ha. Preferably the salicylic acid, a homologue, derivative, or salt thereof is applied at 1 25 g/ha to 100 g/ha.

In one preferred embodiment, a fertiliser composition according to the present invention comprises about 150 g/l phosphonate, about 275 g/l thiosulphate and/or about 10 g/l salicylamide. Preferably the phosphonate comprises about 75 g/l mono-potassium phosphonate and about 75 g/l di-potassium phosphonate.

**Table 1.** Powdery Mildew Score (0 - 9, where higher number equals greater degree of disease)

<b>Treatment</b> (Applied initially and repeated 10 days later)	<b>Days after first spray</b>		
	<b>8 days</b>	<b>12 days</b>	<b>16 days</b>
Untreated	4.0	6.6	7.2
Solution 1 (1L/ha)	0.8	2.2	3.6
Solution 2 (1L/ha)	1.0	1.2	2.4
Solution 3 (1L/ha)	1.6	3.2	4.2
Solution 1 (1L/ha) + Solution 2 (1L/ha)	0.0	0.4	1.0
Solution 1 (1L/ha) + Solution 3 (1L/ha)	0.4	0.6	1.0
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	0.8	0.6	0.6

- 5 Table 1 shows the synergistic effect on disease levels achieved by adding Solutions 1 & 2 (phosphonate + ATS) and between Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together. Disease levels were reduced from a mean of 7.2 to a mean of 0.6
- As well as assessing disease levels, the growth of the plants was assessed by measuring the mean plant diameters after 35 days growth and by measuring the mean above ground fresh and dry weights.

**Table 2.** Plant Growth after treatment with the example solutions

Treatment (Applied initially and repeated 10 days later)	Amount of Rooting (0-9, 0= least rooting) – mean	Plant Diameter (mm) -mean	Above-Ground Fresh Weight (g) – mean	Above-Ground Dry Weight (g) – mean
Untreated	5.3	124	102.3	8.3
Solution 1 (1L/ha)	6.0	148	116.3	9.3
Solution 2 (1L/ha)	5.3	160	109.0	8.7
Solution 3 (1L/ha)	4.7	150	104.7	8.5
Solution 1 (1L/ha) + Solution 2 (1L/ha)	6.7	144	119.0	9.5
Solution 1 (1L/ha) + Solution 3 (1L/ha)	6.7	170	120.7	9.7
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	6.7	168	131.7	10.6

- 5 Table 2 shows the synergistic effect on plant growth caused by adding Solutions 1 & 2 (phosphonate + ATS), Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together.

**Table A2****Percent Powdery Mildew and Fertiliser Attributes – Sugar Beet**

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray		Above Ground Fresh Weight (g) - Mean (x 1 Rate)
	+ 28 Days (x 1 Rate)	+ 35 Days (x 1 Rate)	
Untreated	22	31	144.7
Solution 1	6	4	152.3
Solution 2	2	2	153.3
Solution 1 + Solution 2	0	0	154.3

**Table A3****Fertiliser Attributes – Spring Barley**

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) + 35 Days (x 1 Rate)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)	Amount of Above Ground Tissue (0-9) at Harvest (x 1 Rate)
Untreated	5.6	68.8	7.7	5.0
Solution1	5.6	67.0	7.4	5.3
Solution 2	5.4	68.3	7.2	5.3
Solution 1 + Solution 2	6.6	72.7	7.9	6.0

Fertiliser Attributes – Spring Barley

Treatment (Applied initially and repeated after a 10 day interval)	Amount of Rooting (0-9) (x 1 Rate)	Amount of Above Ground Tissue (0-9) (x 1 Rate)
Untreated	5.2	5.0
Solution 1	5.3	5.7
Solution 3	6.0	5.7
Solution 1 + Solution 3	6.3	6.0

Table B4

Percent Powdery Mildew - Grape

Treatment (Applied initially and repeated at 10 day intervals)	Days After First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	7.3	9.3	11.3	14.0	14.0
KP40 @ 0.75 l/ha	5.3	6.7	8.0	11.3	10.7
KS20 @ 1.0 l/ha	5.3	6.7	8.0	11.3	9.3
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	1.3	2.7	4.0	5.3	4.7

Table B5

% Tuber Blight and Yield Attributes - Potato

Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	4.67	121.3	106
KS20 @ 1.0 l/ha	3.3	255.6	5.07	129.6	113
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	5.67	151.6	133

Table B6

Percent Foliar Blight - Potato

Treatment (Applied initially & repeated at 10 day intervals)	Days after First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	5.3	8.7	12.7	12.7	18.7
KP40 @ 0.75 l/ha	2.7	3.3	6.7	8.7	9.3
KS20 @ 1.0 l/ha	2.0	4.0	5.3	8.0	10.0
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	1.3	1.3	2.0	2.7
					4.7

Table B7

Examples D**POTATO TRIAL****Table D1****% Tuber Blight, Final Yield and Quality**

Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Relative Final Tuber Yield (%)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	100	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	107	4.67	121.3	106
KT47 @ 1.5 l/ha	2.7	261.7	108	5.27	137.9	121
KS20 @ 1.0 l/ha	3.3	255.6	106	5.07	129.6	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	0.7	271.4	112	5.60	152.0	133
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	111	5.67	151.6	133
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	272.2	113	5.60	152.4	133
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	277.0	115	5.80	160.7	141

Table D2

## POTATO TRIAL

## % Tuber Blight, Yield and Quality Benefits

Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	14.0	256.1	5.80	148.5	100
KP40 @ 0.75 l/ha	10.0	271.4	5.73	155.5	105
KT47 @ 1.5 l/ha	9.3	279.2	5.80	161.9	109
KS20 @ 1.0 l/ha	9.3	292.0	5.73	167.3	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	4.0	280.4	5.80	162.6	109
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	4.7	286.3	5.80	166.1	112
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	3.3	290.0	5.87	170.2	115
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	1.3	278.0	6.07	168.7	114

LETTUCE TRIAL  
**Table D5**  
 Fresh Weight Yield and Quality Benefits

(KP40 = 40% Potassium Phosphate; PF723 = 55% Ammonium Thiosulphate; KS20 = 20 gms/litre Potassium Salicylate)

Treatment (Applied Initially and repeated at 10 day Intervals)	Final Fresh Weight Yield (g)	Quality of Final Fresh Weight Yield (0-9)	Final Fresh Weight 'Quality' Yield (g)	Relative Fresh Weight 'Quality' Yield (%)	Median Final Fresh Weight Yield (g)	Median Quality of Final Fresh Weight (0-9)	Median Final Fresh Weight 'Quality' Yield (g)	Relative Median Fresh Weight 'Quality' Yield (%)
Untreated	81.3	5.33	43.4	100	80.6	5.27	42.5	100
KP40 @ 0.75 l/ha	85.0	5.40	45.7	105	87.2	5.36	46.7	110
PF723 @ 1.0 l/ha	87.7	5.40	47.4	109	86.6	5.46	47.3	111
KS20 @ 1.0 l/ha	83.6	5.67	47.4	108	82.6	5.64	46.6	110
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha	89.8	5.63	50.6	117	89.8	5.64	50.6	119
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	90.9	5.53	50.3	116	80.6	5.64	51.1	120
PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	86.5	5.67	49.0	113	85.4	5.64	48.2	113
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	87.9	5.67	49.8	115	88.4	5.64	49.9	117

**CLAIMS**

1. A fertiliser composition comprising at least one phosphonate and at least one thiosulphate.
2. A fertiliser composition according to claim 1 further comprising at least one salicylic acid, homologue, derivative, or salt thereof.
- 10 3. A fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, derivative, or salt thereof.
4. A fertiliser composition according to claim 3 further comprising at least one thiosulphate.
- 15 5. A fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, derivative, or salt thereof.
6. 6. A fertiliser composition according to claim 5 further comprising at least one phosphonate.
- 20 7. A fertiliser composition according to any one of claims 1-4 and 6 wherein the phosphonate is ammonium, sodium or potassium phosphonate or a mixture thereof.
- 25 8. A fertiliser composition according to any one of claims 1 and 4-7 wherein the thiosulphate is ammonium, sodium or potassium thiosulphate or a mixture thereof.

9. A fertiliser composition according to any one of claims 2-8 wherein the derivative of salicylic acid is salicylamide or a salt thereof.
10. A fertiliser composition according to any one of claims 2-8 wherein the 5 homologue of salicylic acid is benzoic acid or a salt or derivative thereof.
11. A fertiliser composition according to any of claims 2-9 wherein the salt of salicylic acid, its homologue or derivative is an organic or inorganic salt.
- 10 12. A fertiliser composition according to claim 11 wherein the salt is a sodium or potassium salt or mixtures thereof.
13. A fertiliser composition according to any preceding claim in the form of a concentrate.
- 15 14. A fertiliser composition according to any one of claims 1-12 in the form of an aqueous solution.
15. A fertiliser composition according to claim 14 comprising 150 g/l phosphonate, 275 g/l thiosulphate and/or 10 g/l salicylamide.
- 20 16. A fertiliser composition according to claim 15 wherein the phosphonate comprises 75 g/l mono-potassium phosphonate and 75 g/l di-potassium phosphonate.
- 25 17. A fertiliser composition according to any preceding claim further comprising a plant growth regulator.
- 30 18. A fertiliser composition according to claim 17 wherein the plant growth regulator is chlormequat.

19. A method for fertilising a plant comprising applying a fertiliser composition according to any preceding claim to the plant or its environs.

5 20. A method according to claim 19 wherein the phosphonate is applied at 150 g/ha to 2 kg/ha.

21. A method according to claim 19 or claim 20 wherein the thiosulphate is applied at 250 g/ha to 6 kg/ha.

10

22. A method according to any one of claims 19 to 21 wherein at least one salicylic acid, a homologue, derivative, or salt thereof is applied at 1 g/ha to 100 g/ha.

15 23. Use of a fertiliser composition according to any one of claims 1-18 to stimulate plant growth.

24. Use of a fertiliser composition according to any one of claims 1-18 to control parasitic fungi.

20

## INTERNATIONAL COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
 United States Patent and Trademark  
 Office  
 Box PCT  
 Washington, D.C.20231  
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 04 October 2000 (04.10.00)	
International application No. PCT/GB00/00367	Applicant's or agent's file reference P006294WO CLM
International filing date (day/month/year) 07 February 2000 (07.02.00)	Priority date (day/month/year) 05 February 1999 (05.02.99)
Applicant WILLIAMS, Richard, Henry et al	

1. The designated Office is hereby notified of its election made:

in the demand filed with the International Preliminary Examining Authority on:

04 September 2000 (04.09.00)

in a notice effecting later election filed with the International Bureau on:

\_\_\_\_\_

2. The election  was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Zakaria EL KHODARY
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

# PENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

**PCT**

To:	MONEY	£	
D YOUNG & CO	URID	Catherine, H.	
Attn. MALLALIE	NAME	15-11-00	
21 New Fetter Lane	RECD	18 SEP 2000	
London EC4A 1DA	AMCO		
UNITED KINGDOM	ENTRY		
	FOH	DXS CLM	
	Records retained		

P/6294 WO

**NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION**

(PCT Rule 44.1)

Applicant's or agent's file reference  P00294WO CLM	Date of mailing (day/month/year)  15/09/2000
International application No.  PCT/GB 00/ 00367	FOR FURTHER ACTION      See paragraphs 1 and 4 below  International filing date (day/month/year)  07/02/2000
Applicant  MANDOPS (UK) LIMITED et al.	

1.  The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland  
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2.  The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3.  With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Toñi Muñoz-Manneken
--	---

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

**When?** Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

**How?** Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

**The amendments must be made in the language in which the international application is to be published.**

#### What documents must/may accompany the amendments?

**Letter (Section 205(b)):**

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

**The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.**

## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

**The following examples illustrate the manner in which amendments must be explained in the accompanying letter:**

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### "Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

**It must be in the language in which the international application is to be published.**

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

## PENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P00294WO CLM</b>	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. <b>PCT/GB 00/ 00367</b>	International filing date (day/month/year) <b>07/02/2000</b>	(Earliest) Priority Date (day/month/year) <b>05/02/1999</b>
Applicant <b>MANDOPS (UK) LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.  
 It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report
  - a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
    - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
  - b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
    - contained in the international application in written form.
    - filed together with the international application in computer readable form.
    - furnished subsequently to this Authority in written form.
    - furnished subsequently to this Authority in computer readable form.
    - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
    - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
2.  Certain claims were found unsearchable (See Box I).
3.  Unity of invention is lacking (see Box II).
4. With regard to the title,
  - the text is approved as submitted by the applicant.
  - the text has been established by this Authority to read as follows:  
**PHOSPHONATE OR THIOSULFATE BASED FERTILISERS**
5. With regard to the abstract,
  - the text is approved as submitted by the applicant.
  - the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is Figure No.
  - as suggested by the applicant.
  - because the applicant failed to suggest a figure.
  - because this figure better characterizes the invention.

None of the figures.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 00/00367

### Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1 (totally), 5-22 (partially)

Fertiliser composition comprising at least one phosphonate and at least one thiosulphate, a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

2. Claims: 2 (totally), 3 (totally), 5-22 (partially)

Fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, etc., a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

3. Claims: 4 (totally), 6-22 (partially)

Fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, etc., a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00367

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C05B17/00 C05D9/00

C05D9/02

C05G3/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C05B C05D C05G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 795 847 A (NIELSEN ERIK ET AL) 18 August 1998 (1998-08-18) column 9, line 1 - line 66 ---	1,5,6, 11,12,17
A	US 5 865 870 A (HSU HSINHUNG JOHN) 2 February 1999 (1999-02-02) column 1, line 59 -column 2, line 29 claims ---	1,5-22
A	US 5 707 418 A (HSU HSINHUNG JOHN) 13 January 1998 (1998-01-13) cited in the application the whole document ---	1,5-22

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

30 August 2000

Date of mailing of the international search report

15. 09. 2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

RODRIGUEZ FONTAO, M

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00367

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
D4 A	US 5 514 200 A (LOVATT CAROL J) 7 May 1996 (1996-05-07) cited in the application column 2, line 58 -column 6, line 20 claims ---	1,5-22
D5 A	BIOLOGICAL ABSTRACTS, vol. 1, 1996 Philadelphia, PA, US; abstract no. 193987, SEVENIER, ROBERT ET AL: "Ethylene production and involvement during the first steps of durum wheat ( <i>Triticum</i> <i>durum</i> ) anther culture." XP002133847 abstract & PHYSIOLOGIA PLANTARUM, (1996) VOL. 96, NO. 1, PP. 146-151.,	1
D6 X	US 5 047 078 A (GILL JASBIR S) 10 September 1991 (1991-09-10)  claims column 2, line 47 -column 3, line 29 ---	2,5, 8-11,17, 21
D7 X	EP 0 878 129 A (ISKRA INDUSTRY CO LTD) 18 November 1998 (1998-11-18)  claims page 1, line 27 -page 3, line 2 page 5, line 22 - line 25 ---	2,5,7,9, 11,12, 15,17, 21,22
D8 X	DD 226 755 A (ADL FORSCHUNGSZENTRUM FUER BOD) 4 September 1985 (1985-09-04)  the whole document ---	2,5, 8-11,17, 21
D9 X	DATABASE WPI Section Ch, Week 199431 Derwent Publications Ltd., London, GB; Class E19, AN 1994-252656 XP002146194 & JP 06 183903 A (HYPONEX JAPAN KK), 5 July 1994 (1994-07-05) abstract -----	4

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/GB 00/00367

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 5795847	A 18-08-1998	DK AT AU AU CA DE DE WO EP ES	111793 A 167356 T 685437 B 6256894 A 2157526 A 69411156 D 69411156 T 9419941 A 0688165 A 2120017 T	10-09-1994 15-07-1998 22-01-1998 26-09-1994 15-09-1994 23-07-1998 12-11-1998 15-09-1994 27-12-1995 16-10-1998
US 5865870	A 02-02-1999	US AU AU EP WO	5707418 A 718565 B 5159098 A 0897378 A 9832714 A	13-01-1998 13-04-2000 18-08-1998 24-02-1999 30-07-1998
US 5707418	A 13-01-1998	AU AU EP WO US	718565 B 5159098 A 0897378 A 9832714 A 5865870 A	13-04-2000 18-08-1998 24-02-1999 30-07-1998 02-02-1999
US 5514200	A 07-05-1996	AU BR CA EP WO US	1739795 A 9506959 A 2182300 A 0743931 A 9521142 A 5830255 A	21-08-1995 16-09-1997 10-08-1995 27-11-1996 10-08-1995 03-11-1998
US 5047078	A 10-09-1991	AT AU AU CA DE EP JP JP JP NZ ZA	45563 T 589959 B 5708786 A 1287744 A 3665057 D 0203734 A 2083664 C 5075720 B 61256991 A 215916 A 8603220 A	15-09-1989 26-10-1989 06-11-1986 20-08-1991 21-09-1989 03-12-1986 23-08-1996 21-10-1993 14-11-1986 26-04-1989 30-12-1986
EP 0878129	A 18-11-1998	NONE		
DD 226755	A 04-09-1985	NONE		
JP 6183903	A 05-07-1994	NONE		

## PATENT COOPERATION TREATY

By fax in advance

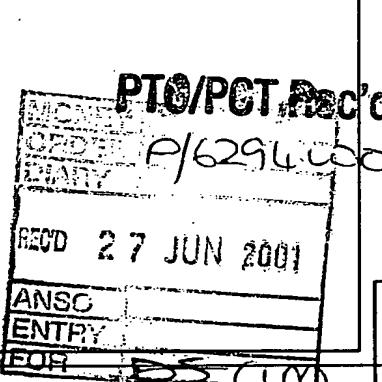
44 207 3537777

PCT

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

MALLALIEU, Catherine,H.  
D YOUNG & CO  
21 New Fetter Lane  
London EC4A 1DA  
GRANDE BRETAGNE

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing (day/month/year)	22.06.2001
-------------------------------------	------------

Applicant's or agent's file reference

P00294WO CLM

## IMPORTANT NOTIFICATION

International application No. PCT/GB00/00367	International filing date (day/month/year) 07/02/2000	Priority date (day/month/year) 05/02/1999
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Applicant

MANDOPS (UK) LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

**4. REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  Dekker, M Tel.+31 70 340-4046	
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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>P00294WO CLM</b>	<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. <b>PCT/GB00/00367</b>	International filing date (day/month/year) <b>07/02/2000</b>	Priority date (day/month/year) <b>05/02/1999</b>	
International Patent Classification (IPC) or national classification and IPC <b>C08B17/00</b>			
<p><b>Applicant</b>  <b>MANDOPS (UK) LIMITED et al.</b></p>			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of X sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I   <input checked="" type="checkbox"/> Basis of the report</li> <li>II   <input type="checkbox"/> Priority</li> <li>III   <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV   <input checked="" type="checkbox"/> Lack of unity of invention</li> <li>V   <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI   <input type="checkbox"/> Certain documents cited</li> <li>VII   <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII   <input checked="" type="checkbox"/> Certain observations on the international application</li> </ul>			

Date of submission of the demand <b>04/09/2000</b>	Date of completion of this report <b>22.06.2001</b>
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer   <b>RODRIGUEZ FONTAO, M</b> Telephone No. +31 70 340 3758

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/00367

## I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1,2,4,5,7-10,13,      as originally filed  
15-20,23-26,29,30,  
32-35

3,6,11,12,14,21,	as received on	30/04/2001 with letter of	27/04/2001
22,27,28,31			

### Claims, No.:

1-24	as received on	30/04/2001 with letter of	27/04/2001
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2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description,      pages:
- the claims,      Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/00367

- the drawings, sheets:
5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*
6. Additional observations, if necessary:

## IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:
- restricted the claims.
- paid additional fees.
- paid additional fees under protest.
- neither restricted nor paid additional fees.
2.  This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- complied with.
- not complied with for the following reasons:
4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:
- all parts.
- the parts relating to claims Nos. 1-4, 7-24.

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)                  Yes: Claims 1,2  
                                No: Claims 3-4,7-24

Inventive step (IS)           Yes: Claims 1,2  
                                No: Claims 3,4,7-24

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/00367

Industrial applicability (IA) Yes: Claims 1-4,7-24  
No: Claims

**2. Citations and explanations**  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**s separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**se separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/00367

**R It m IV**

**Lack of unity of invention**

This International Examination Authority found multiple (groups of) inventions in this international application, as follows:

**1. Claims: 1,2, 7-24 (partially; as far as dependent on claim 1)**

Fertiliser composition comprising at least one phosphonate and at least one thiosulphate, a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

**2. Claims: 3,4, 7-24 (partially; as far as dependent on claim 3)**

Fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, etc, a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

**3. Claims: 5,6,7-24 (partially; as far as dependent on claim 5)**

Fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, etc., a method for fertilising a plant by applying this composition and its use to stimulate plant growth and to control parasitic fungi.

The application lacks unity of invention as required by Article 3(4)(iii) and 34(3)(a) PCT for the following reasons:

The present application contains the following independent "product" claims. In relation to these claims the following separate inventions were identified:

- I. (Claim 1): A fertiliser composition comprising at least one phosphonate and at least one thiosulphate.
- II. (Claim 3): A fertiliser composition comprising at least one phosphonate and at least one salicylic acid, homologue, derivative or salt thereof.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/00367

III. (Claim 5): A fertiliser composition comprising at least one thiosulphate and at least one salicylic acid, homologue, derivative or salt thereof.

Claims 1 and 3 solve the problem of improving the low fertilising effect of phosphonate and its limitations as fungicide when used alone (see application, page 2, first paragraph). The problem appears to be solved by combining the phosphonate with either a thiosulphate or a salicylic acid (homologue, derivative, etc.).

Claim 5 does not mention the presence of phosphonate. Apparently the problem solved by this claim is in relation with the improving of the fertilising and/or antifungal effect of thiosulphate and salicylic acid combinations in relation to the effect of the same compounds used individually.

As both problems and solutions are different, no single general concept can be formulated based on the technical features of the three inventions. No other technical features could be found which could be accepted as special technical features (Rule 13.2 PCT) serving to establish a technical link among all of the different inventions and therefore it is considered that there is no single inventive concept underlying the different inventions of the present application.

In consequence it is established that the requirements of Rule 13.1 PCT are not met and there is lack of unity "prima facie" between the group of inventions of claims 1 and 3 in relation to the invention of claim 5.

Furthermore the common concept derivable from claims 1 and 3, i.e. a composition comprising a phosphonate where the fertiliser and/or antifungal properties of this compound are enhanced by mixing the phosphonate with another component is not new in view of US-A-5865870 (D1)

D1 discloses that phosphorous acid or its salts , in combination with polyphosphoric acid or its salts, when used as plant fertiliser, has a synergistic effect that improves plant growth more than if the same compounds are used individually (see column 2, lines 10-16).

Document D1 is prejudicial for the novelty of the single general concept linking the

**INTERNATIONAL PRELIMINARY  
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International application No. PCT/GB00/00367

inventions of claim 1 and claim 3. No other technical features could be found which could be accepted as special technical features serving to establish a technical link among the two inventions and therefore the compositions of claim 1 and claim 3 lack unity in view of D1.

**Re Item V**

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: US-A-5865870

D2: US-A-5707418

D3: US-A-5514200

D4: US-A-5795847

D5: US-A-5047078

D6: DD-A-266755

**Independent claim 1**

The subject matter of claim 1 is considered to involve an inventive step (Art 33(3) PCT) in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

Document D1 is considered as the closest prior art. This document describes a phosphorus fertiliser having a combination of phosphorous acid or its salts (phosphonates) with phosphoric acid or its salts.

The difference between the subject-matter of claim 1 and the closest prior art consists in that the claimed fertiliser contains thiosulphate in addition to the phosphonate salt.

The technical effect caused by the inclusion of thiosulphate is a synergistic fertilising effect together with a decreased risk of ascomycete infection (see description, page 2, first paragraph)

The problem to be solved in view of the closest prior art could be considered as an

**INTERNATIONAL PRELIMINARY  
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improvement of agricultural value of phosphonate.

D4 discloses a herbicidal composition containing additional electrolytes such as phosphite or thiosulphate (see column 9, lines 1-66). The combination of phosphonate with thiosulphate in order to improve the fertiliser activity of the former is not suggested in any of the cited relevant cited documents of the prior art. The subject-matter of claim 1 is therefore considered to involve an inventive step (Art 33(3) PCT)

The subject-matter of claim 1 would also be considered as involving an inventive step if D2 or D3 were considered as closest prior art.

**Independent claim 3**

The subject matter of claim 3 is not new in respect of prior art (Article 33(2) PCT) as defined in the regulations (Rule 64(1)-(3) PCT).

D5 discloses the use of a salicylic acid derivative vinylbenzoic acid in combination with phosphonates to increase the fertiliser activity of compositions containing phosphate (see column 2, line 68 - column 3 line 29). The subject-matter of claim 3 is considered to lack novelty in view of this document.

D6 discloses also a composition containing phosphonate and salicylic acid or derivative (see claim 2) as fertilisers. The subject-matter of claim 3 is considered to lack novelty in view of this document.

The subject-matter of claim 23 lacks also novelty in view of D5 and D6.

The subject-matter of claim 24 lacks also novelty in view of D4

**Re Item VII**

Certain defects in the international application

a) Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D6 has not been mentioned in the description, nor have these documents been identified therein.

**INTERNATIONAL PRELIMINARY  
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- b) The independent claims have not been drafted in the two-part form in accordance with Rule 6.3(b) PCT.

**Re Item VIII**

Certain observations on the international application

The expression "salicylic acid, homologue, derivatives or salt thereof" used in claim 3 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT). Furthermore claim 3 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description.

20 JUL 2001

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an even greater effect if all three components (ie phosphonate, thiosulphate and salicylic acid, homologue, salt or derivative thereof) were used together. The combination of thiosulphate with a salicylic acid, homologue, salt or derivative thereof, in the absence of phosphonate, also produces a fertiliser effect and fungicidal effect.

Fertilisers based on the present invention provide a greater growth effective response than phosphonates or thiosulphates alone and the degree of fungicidal protection or resistance is broader than that achieved with phosphonates or thiosulphates alone. Plants treated with the present invention suffer less from phycomycete diseases (for example *phytophthoras* and downy mildews) than those treated with for example phosphonate alone and are also less prone to other parasitic fungi such as powdery mildews. Thus the present invention provides a means for applying a single product to plants which is an effective fungicide as well as an effective fertiliser.

Another advantage of the present invention is that the formulation is very storage stable, for example tests on mixtures of potassium phosphonate and ammonium thiosulphate stored for over one year have shown that there is no oxidation of the phosphonate to phosphate and the stored material shows no signs of cloudiness or precipitation. The use of further organic acids as buffers (as in required in US Patent Nos. 5,514,200 & 5,830,255) is also not required to achieve stable solutions.

By "phosphonate" we mean a salt of phosphonic acid ( $H_3PO_3$ ). Phosphonates contain the trivalent  $\equiv PO_3$  radical. For the avoidance of doubt, phosphonic acid is sometimes referred to as phosphorous acid and its salts as phosphites. Mixtures of phosphonates may be employed.

The phosphonate may be any metal ion or other cation which forms such a salt. As phosphonic acid has a P-H bond it forms a mono and di series of salts. Both mono and di salts and mixtures thereof may be used in the present invention. Preferably the phosphonate is an ammonium phosphonate or alkali phosphonate. Amongst the alkali phosphonates, sodium or potassium

In one particularly preferred embodiment the composition further comprises further a plant growth regulator. Preferably the plant growth regulator is chlormequat.

In order to apply the composition to the plant or environs of the plant, the 5 composition may be used as a concentrate or more usually is formulated into a composition which includes an effective amount of the composition of the present invention together with a suitable inert diluent, carrier material and/or surface active agent. Preferably the composition is in the form of an aqueous solution which may be prepared from the concentrate. By effective amount we 10 mean that the composition (and/or its individual components) provides a fertilising and/or antifungal effect. Preferably an effective amount of the components is a concentration of up to about 4M phosphonate, up to about 5M thiosulphate and/or up to about 0.8M salicylate. Thus, in one embodiment the concentrate may comprise up to about 10M of the components. The concentrate 15 formulation may for example be diluted at ratios of concentrate to water of about 1:40 to 1:600, and generally is formulated to have pH of about 6.5 to 8.5. At a 1:40 dilution, a concentrate of about 10M would give rise to an application concentrate of up to about 0.25M.

The rate and timing of application will depend on a number of factors 20 known to those skilled in the art, such as the type of species etc.

The composition is generally applied in an amount of from 0.01 to 10kg per hectare, preferably 0.1 to 6kg per hectare. Preferably the phosphonate is applied at 150 g/ha to 2 kg/ha. Preferably the thiosulphate is applied at 250 g/ha to 6 kg/ha. Preferably the salicylic acid, a homologue, derivative, or salt thereof 25 is applied at 1 g/ha to 100 g/ha.

In one preferred embodiment, a fertiliser composition according to the present invention comprises about 150 g/l phosphonate, about 275 g/l thiosulphate and/or about 10 g/l salicylamide. Preferably the phosphonate comprises about 75 g/l mono-potassium phosphonate and about 75 g/l di-potassium phosphonate. 30

**Table 1. Powdery Mildew Score (0 - 9, where higher number equals greater degree of disease)**

<b>Treatment</b> (Applied initially and repeated 10 days later)	<b>Days after first spray</b>		
	8 days	12 days	16 days
Untreated	4.0	6.6	7.2
Solution 1 (1L/ha)	0.8	2.2	3.6
Solution 2 (1L/ha)	1.0	1.2	2.4
Solution 3 (1L/ha)	1.6	3.2	4.2
Solution 1 (1L/ha) + Solution 2 (1L/ha)	0.0	0.4	1.0
Solution 1 (1L/ha) + Solution 3 (1L/ha)	0.4	0.6	1.0
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	0.8	0.6	0.6

- 5 Table 1 shows the synergistic effect on disease levels achieved by adding Solutions 1 & 2 (phosphonate + ATS) and between Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together. Disease levels were reduced from a mean of 7.2 to a mean of 0.6
- 10 As well as assessing disease levels, the growth of the plants was assessed by measuring the mean plant diameters after 35 days growth and by measuring the mean above ground fresh and dry weights.

**Table 2. Plant Growth after treatment with the example solutions**

Treatment (Applied initially and repeated 10 days later)	Amount of Rooting (0-9, 0= least rooting) - mean	Plant Diameter (mm) -mean	Above-Ground Fresh Weight (g) – mean	Above-Ground Dry Weight (g) – mean
Untreated	5.3	124	102.3	8.3
Solution 1 (1L/ha)	6.0	148	116.3	9.3
Solution 2 (1L/ha)	5.3	160	109.0	8.7
Solution 3 (1L/ha)	4.7	150	104.7	8.5
Solution 1 (1L/ha) + Solution 2 (1L/ha)	6.7	144	119.0	9.5
Solution 1 (1L/ha) + Solution 3 (1L/ha)	6.7	170	120.7	9.7
Solution 1 (1L/ha) + Solution 2 (1L/ha) + Solution 3 (1L/ha)	6.7	168	131.7	10.6

- 5 Table 2 shows the synergistic effect on plant growth caused by adding Solutions 1 & 2 (phosphonate + ATS), Solutions 1 & 3 (phosphonate + salicylamide) and the further effect of using all three solutions together.

**Table A2****Percent Powdery Mildew and Fertiliser Attributes – Sugar Beet**

Treatment (Applied initially and repeated after a 10 day interval)	Days After First Spray		Above Ground Fresh Weight (g) - Mean (x 1 Rate)
	+ 28 Days (x 1 Rate)	+ 35 Days (x 1 Rate)	
Untreated	22	31	144.7
Solution 1	6	4	152.3
Solution 2	2	2	153.3
Solution 1 + Solution 2	0	0	154.3

**Table A3****Fertiliser Attributes – Spring Barley**

Treatment (Applied initially and repeated after a 10 day interval)	Plant Health 'Greenness' Score (0-9) +35 Days (x 1 Rate)	Above Ground Fresh Weight (g) - Mean (x 1 Rate)	Above Ground Dry Weight (g) - Mean (x 1 Rate)	Amount of Above Ground Tissue (0-9) at Harvest (x 1 Rate)
Untreated	5.6	68.8	7.7	5.0
Solution1	5.6	67.0	7.4	5.3
Solution 2	5.4	68.3	7.2	5.3
Solution 1 + Solution 2	6.6	72.7	7.9	6.0

Fertiliser Attributes – Spring Barley

Treatment (Applied initially and repeated after a 10 day interval)	Amount of Rooting (0-9) (x 1 Rate)	Amount of Above Ground Tissue (0-9) (x 1 Rate)
Untreated	5.2	5.0
Solution 1	5.3	5.7
Solution 3	6.0	5.7
Solution 1 + Solution 3	6.3	6.0

Table B4

Powdery Mildew - Grape

Treatment (Applied initially and repeated at 10 day intervals)	Days After First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	7.3	9.3	11.3	14.0	14.0
KP40 @ 0.75 l/ha	5.3	6.7	8.0	11.3	10.7
KS20 @ 1.0 l/ha	5.3	6.7	8.0	11.3	9.3
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	1.3	2.7	4.0	5.3	4.7
					4.7

Table B5

**Table B6**

% Tuber Blight and Yield Attributes					
Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	4.67	121.3	106
KS20 @ 1.0 l/ha	3.3	255.6	5.07	129.6	113
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	5.67	151.6	133

**Table B7**

Treatment (Applied initially & repeated at 10 day intervals)	Days after First Spray				
	+ 16 Days	+ 20 Days	+ 24 Days	+ 28 Days	+ 32 Days
Untreated	5.3	8.7	12.7	12.7	18.7
KP40 @ 0.75 l/ha	2.7	3.3	6.7	8.7	9.3
KS20 @ 1.0 l/ha	2.0	4.0	5.3	8.0	10.0
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	1.3	1.3	2.0	2.7
					4.7

Examples D

## POTATO TRIAL

Table D1

## % Tuber Blight, Final Yield and Quality

Treatment (Applied initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Relative Final Tuber Yield (%)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	6.0	241.7	100	4.73	114.3	100
KP40 @ 0.75 l/ha	2.7	259.8	107	4.67	121.3d	106d
KT47 @ 1.5 l/ha	2.7	261.7	108	5.27	137.9	121
KS20 @ 1.0 l/ha	3.3	255.6	106	5.07	129.6	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	0.7	271.4	112	5.60	152.0	133
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	0.7	267.4	111	5.67	151.6	133
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	272.2	113	5.60	152.4	133
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	0.7	277.0	115	5.80	160.7	141

POTATO TRIAL  
Table D2

## % Tuber Blight, Yield and Quality Benefits

Treatment (Applied Initially and repeated at 10 day intervals)	Percent Tuber Blight (%)	Final Tuber Yield (g)	Final Tuber 'Quality' (Premium Potatoes) (0-9)	Mean Final 'First Grade' Tuber Yield (g)	Relative Final 'First Grade' Tuber Yield (%)
Untreated	14.0	256.1	5.80	148.5b	100b
KP40 @ 0.75 l/ha	10.0	271.4	5.73	155.5	105.
KT47 @ 1.5 l/ha	9.3	279.2	5.80	161.9	109.
KS20 @ 1.0 l/ha	9.3	292.0	5.73	167.3	113
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha	4.0	280.4	5.80	162.6	109.
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	4.7	286.3	5.80	166.1	112
KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	3.3	290.0	5.87	170.2	115
KP40 @ 0.75 l/ha + KT47 @ 1.5 l/ha + KS20 @ 1.0 l/ha	1.3	278.0	6.07	168.7	114

## LETUCE TRIAL

Table D5

## Fresh Weight Yield and Quality Benefits

(KP40 = 40% Potassium Phosphate; PF723 = 55% Ammonium Thiosulphate; KS20 = 20 gms/litre Potassium Selenylate)

Treatment (Applied Initially and repeated at 10 day Intervals)	Final Fresh Weight Yield (g)	Quality of Final Fresh Weight Yield (0-9)	Final Fresh Weight 'Quality' Yield (g)	Relative Fresh Weight 'Quality' Yield (%)	Median Final Fresh Weight Yield (g)	Median Quality of Final Fresh Weight Yield (0-9)	Median Final Fresh Weight 'Quality' Yield (g)	Relative Median Fresh Weight 'Quality' Yield (%)
Untreated	81.3	5.33	43.4C	100C	80.6	5.27	42.5	100
KP40 @ 0.75 l/ha	85.0	5.40	45.7	105	87.2	5.36	46.7	110
PF723 @ 1.0 l/ha	87.7	5.40	47.4	109	86.6	5.46	47.3	111
KS20 @ 1.0 l/ha	83.6	5.67	47.4	109	82.6	5.64	46.6	110
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha	89.8	5.63	50.6	117	89.8	5.64	50.6	119
KP40 @ 0.75 l/ha + KS20 @ 1.0 l/ha	80.9	5.53	50.3	116	80.6	5.64	51.1	120
PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	86.5	5.67	48.0	113	85.4	5.64	48.2	113
KP40 @ 0.75 l/ha + PF723 @ 1.0 l/ha + KS20 @ 1.0 l/ha	87.9	5.67	49.8	115	88.4	5.64	49.9	117

## CLAIMS

1. A fertiliser composition comprising at least one phosphonate and at least  
5 one thiosulphate.
2. A fertiliser composition comprising at least one phosphonate and at least  
one salicylic acid, homologue, derivative, or salt thereof.
- 10 3. A fertiliser composition according to claim 2 further comprising at least  
one thiosulphate.
4. A fertiliser composition comprising at least one thiosulphate and at least  
one salicylic acid, homologue, derivative, or salt thereof.
- 15 5. A fertiliser composition according to any one of claims 1-3 wherein the  
phosphonate is ammonium, sodium or potassium phosphonate or a mixture  
thereof.
- 20 6. A fertiliser composition according to any one of claims 1 and 3-5 wherein  
the thiosulphate is ammonium, sodium or potassium thiosulphate or a mixture  
thereof.
- 25 7. A fertiliser composition according to any one of claims 2-6 wherein the  
derivative of salicylic acid is salicylamide or a salt thereof.
8. A fertiliser composition according to any one of claims 2-6 wherein the  
homologue of salicylic acid is benzoic acid or a salt or derivative thereof.

9. A fertiliser composition according to any of claims 2-7 wherein the salt of salicylic acid, its homologue or derivative is an organic or inorganic salt.
10. A fertiliser composition according to claim 9 wherein the salt is a sodium or potassium salt or mixtures thereof.  
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11. A fertiliser composition according to any preceding claim in the form of a concentrate.
- 10 12. A fertiliser composition according to any one of claims 1-10 in the form of an aqueous solution.
13. A fertiliser composition according to claim 12 comprising 150 g/l phosphonate, 275 g/l thiosulphate and/or 10 g/l salicylamide.  
15
14. A fertiliser composition according to claim 13 wherein the phosphonate comprises 75 g/l mono-potassium phosphonate and 75 g/l di-potassium phosphonate.
- 20 15. A fertiliser composition according to any preceding claim further comprising a plant growth regulator.
16. A fertiliser composition according to claim 15 wherein the plant growth regulator is chlormequat.  
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17. A method for fertilising a plant comprising applying a fertiliser composition according to any preceding claim to the plant or its environs.
18. A method according to claim 17 wherein the phosphonate is applied at  
30 150 g/ha to 2 kg/ha.

19. A method according to claim 17 or claim 18 wherein the thiosulphate is applied at 250 g/ha to 6 kg/ha.
- 5 20. A method according to any one of claims 17 to 19 wherein at least one salicylic acid, a homologue, derivative, or salt thereof is applied at 1 g/ha to 100 g/ha.
- 10 21. Use of a fertiliser composition according to any one of claims 1-16 to stimulate plant growth.
22. Use of a fertiliser composition according to any one of claims 1-16 to control parasitic fungi.